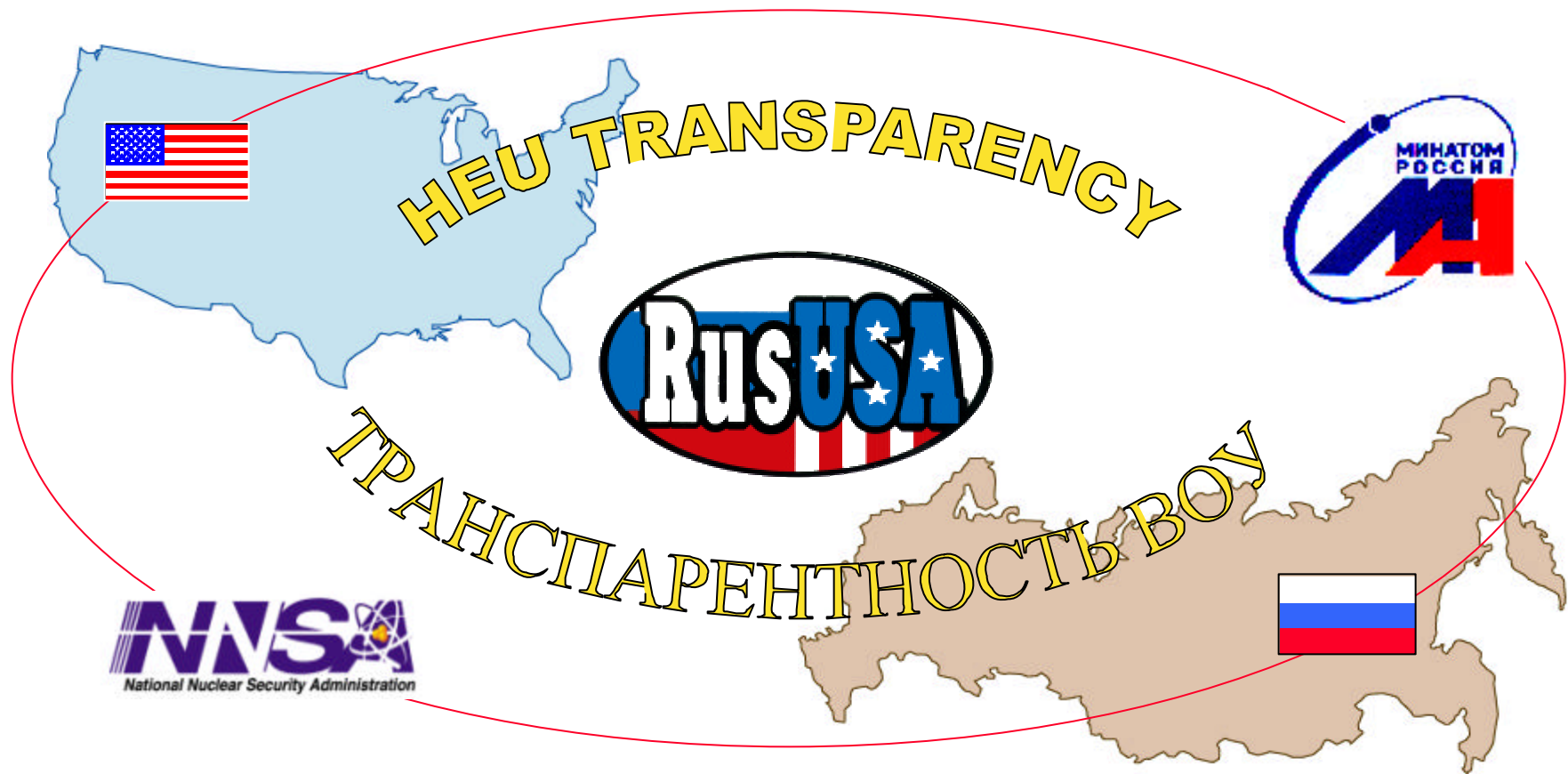

Highly Enriched Uranium Transparency Implementation Program

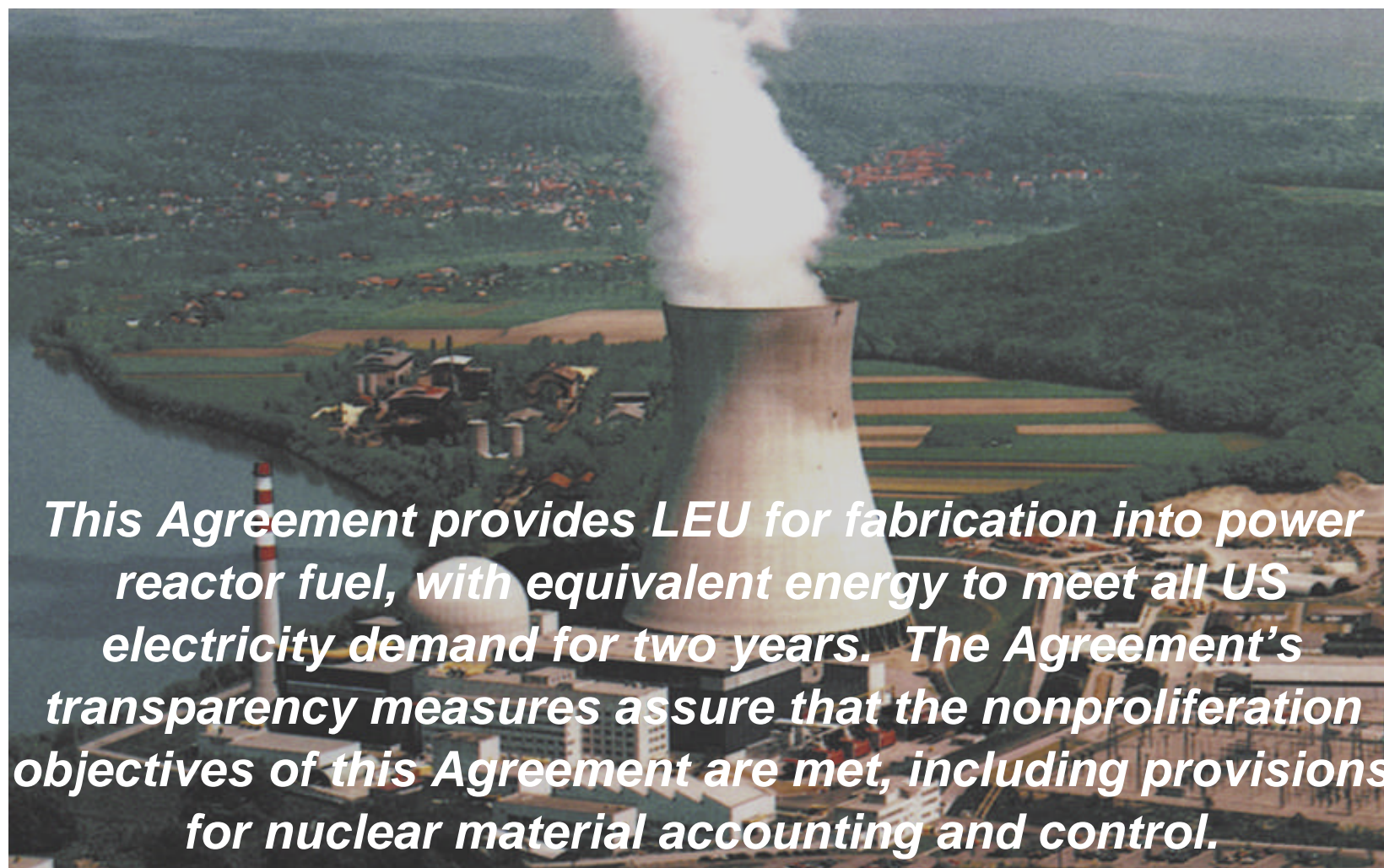


The United States - Russian Intergovernmental HEU-LEU Agreement



“Megatons” are being converted to.....

The United States - Russian Intergovernmental HEU-LEU Agreement



.....“Megawatts” under the U.S.-Russian
Intergovernmental HEU-LEU Agreement

Evolution of the HEU-LEU Agreement

August 31, 1992: President Bush (pictured with President Yeltsin) announced that the United States and the Russian Federation have negotiated and initialed the HEU Purchase Agreement



March 18, 1994: Vice-President Gore and Russian Prime Minister Chernomyrdin sign Protocol on HEU Transparency Arrangements in Washington, D.C.

June 30, 1995: Energy Secretary O'Leary and Russian Minister Mikhailov sign Joint Statement on Transparency Arrangements in Moscow



Transparency Overview



- **Transparency is those agreed upon measures used to build confidence that the arms control and nonproliferation objectives of the 1993 United States - Russian Highly Enriched Uranium (HEU) Agreement are being met.**
- **The goal of the HEU Transparency Implementation Program (TIP) is to support the implementation of United States nonproliferation policy by providing confidence that Russian low enriched uranium (LEU) sold to the United States is derived from HEU removed from dismantled Russian nuclear weapons.**
- **The Program benefits United States nonproliferation policy by assuring the conversion of 500 metric tons of weapon-grade HEU in Russia, equivalent to about 20,000 nuclear weapons.**

Transparency Under the Intergovernmental HEU-LEU Agreement

- Transparency measures are to assure that:

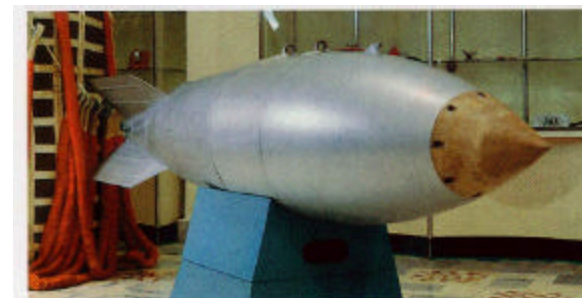
HEU is extracted from dismantled Russian nuclear weapons.



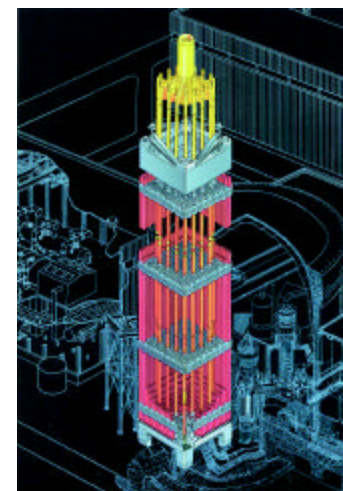
Weapon HEU converted to "chips"

This same HEU is converted and downblended to LEU

The LEU shipped to the United States is fabricated into fuel for commercial nuclear reactors



Nuclear bomb display in Russia



Artist's Concept of a fuel rod assembly being installed in a nuclear power reactor

- Transparency is designed to be evolutionary by gradually increasing levels of assurance

Transparency Chronology



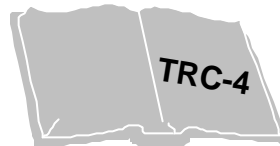
September 1994



July 1995



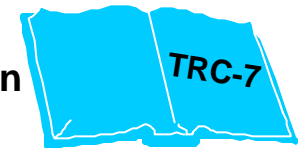
November 1995



April 1996



December 1996



July 1999



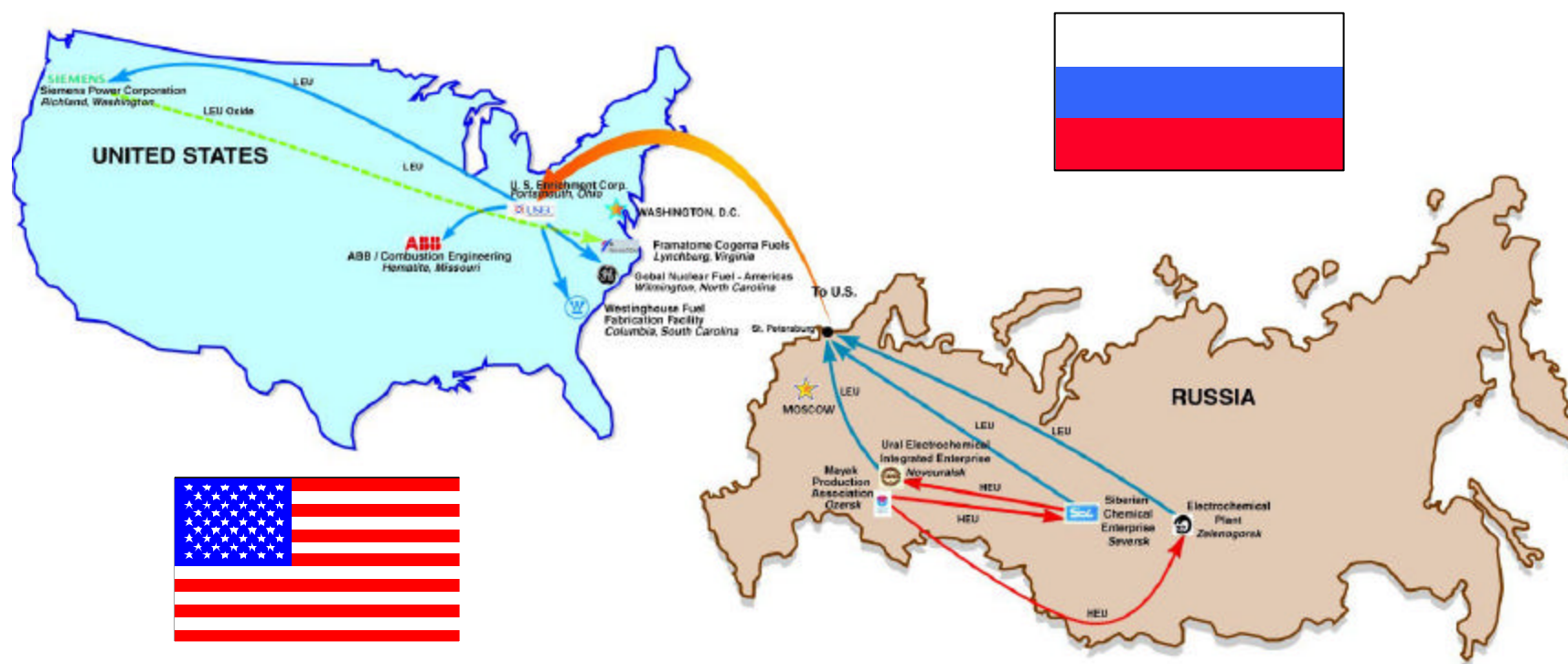
February 1998



November 1997

- The United States held the first HEU transparency discussions with Russia in March 1993.
- In May 1993 a US delegation conducted the first visit to a Russian processing facility where HEU will be blended down into LEU.
- In June 1993 a Russian delegation conducted its first visit to the Portsmouth, Ohio Enrichment Plant and to a US fuel fabricator.
- Memorandum of Understanding related to Transparency signed in September 1993.
- Protocol to the MOU signed in March 1994. It provides additional details on transparency rights and establishes the US/Russian Transparency Review Committee (TRC).
- The second TRC signs Annexes 1 & 2. Each annex provides specific detail on implementing monitoring rights for each country.
- On June 23, 1995, the first shipment of LEU converted from weapons HEU arrives at the Portsmouth, Ohio enrichment plant.

Facilities Subject to the Agreement



Arrows Indicate the Flow of Material

Red is HEU Gold / Blue is LEU

Russian Facilities and Processes



Four Russian facilities operate together to receive HEU weapon components from dismantled Russian nuclear weapons and blend into LEU:



Electrochemical Plant, Zelenogorsk



Mayak Production Association, Ozersk



Siberian Chemical Enterprise, Seversk



Ural Electrochemical Integrated Plant, Novouralsk

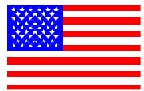
Process Facilities in the United States



Portsmouth Gaseous Diffusion Plant receives the LEU shipped from Russia



Last Russian Monitoring visit to the United States was in October 2000



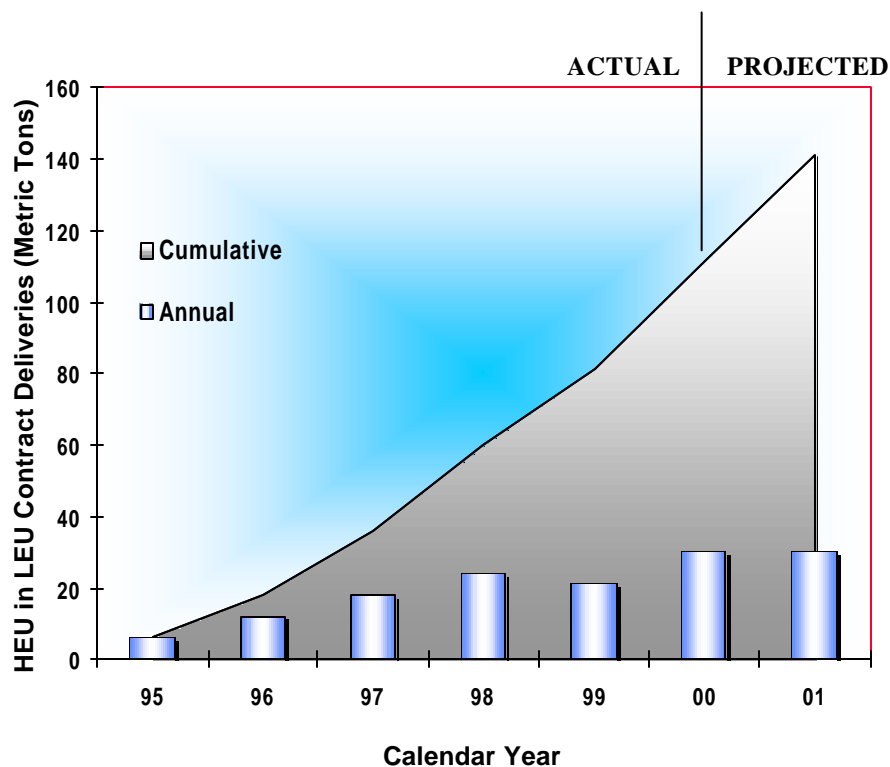
Five fuel fabricators convert Russian origin LEU into commercial power reactor fuel



Three Russian monitors (left) at Global Nuclear Fuel inspecting cylinders that contain LEU purchased from Russia

- ***Westinghouse Nuclear Fuel, Columbia, SC***
- ***Global Nuclear Fuel - Americas, Wilmington, NC***
- ***Framatome Cogema, Lynchburg, VA***
- ***ABB Combustion Engineering, Hematite, MO***
- ***Siemens Power Corporation, Richland, WA***

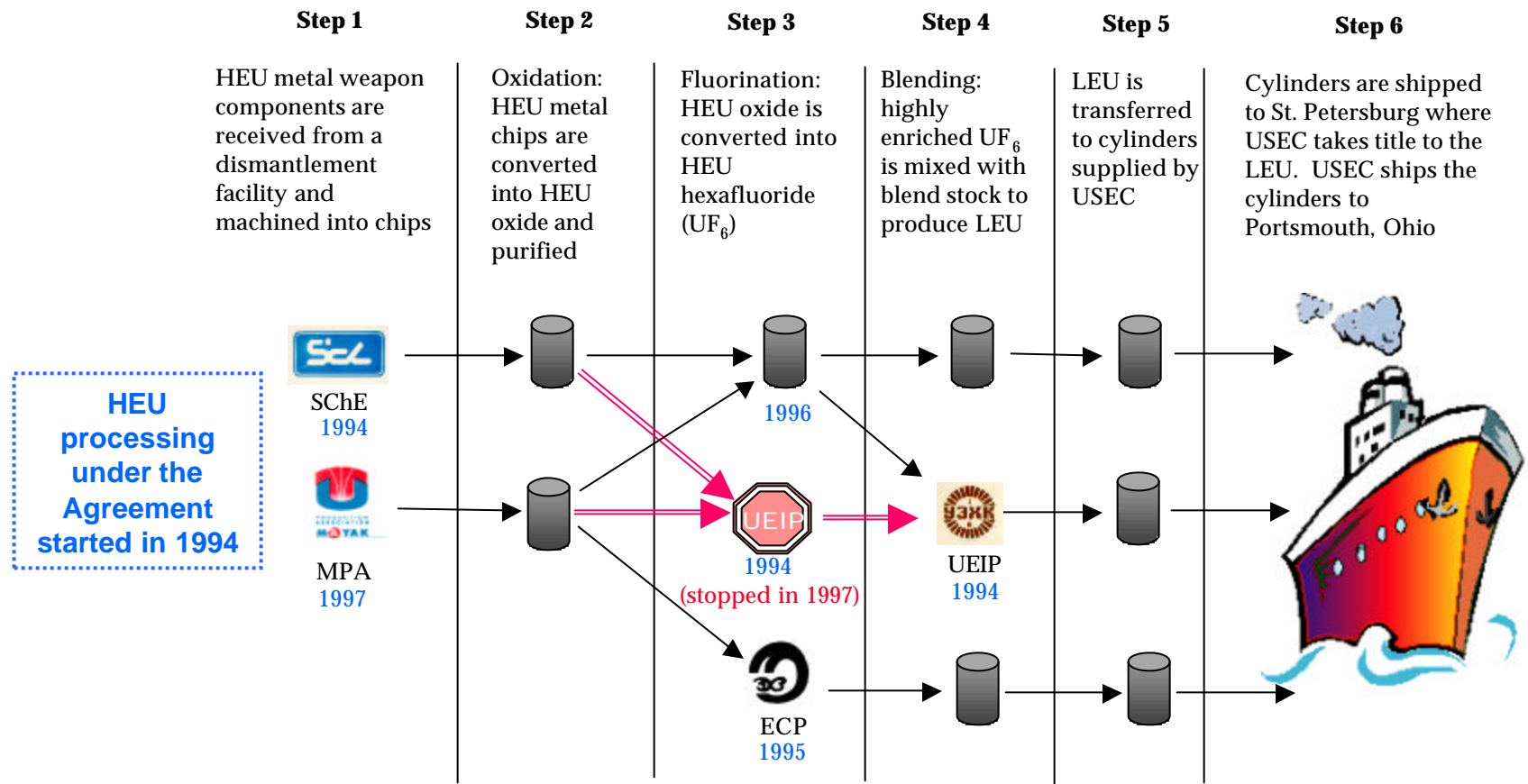
Russian HEU Conversion Rates



- Russia blended 30 metric tons (MT) of HEU and delivered 858 MT of LEU under contract for CY 2000. This is equivalent to about 1,200 nuclear devices*.
- A total of 111.3 MT of HEU has been converted to LEU. This is equivalent to about 4,500 nuclear devices*.
- USEC has paid Russia a total of about \$1.7 billion. DOE paid Russia \$325 million in FY 1999 for uranium purchases.
- Converting 500 MT of HEU into 15,000 MT of LEU will be completed in 2013 under the 20-year, \$12 billion contract.
- 500 MT of HEU is roughly equivalent to 20,000 nuclear devices*.
- Conversion of HEU into LEU is about one year ahead of the original schedule.

* Per IAEA standard for significant quantity of nuclear material

Transparency Implementation: Monitoring the Conversion of HEU Weapons Components to LEU

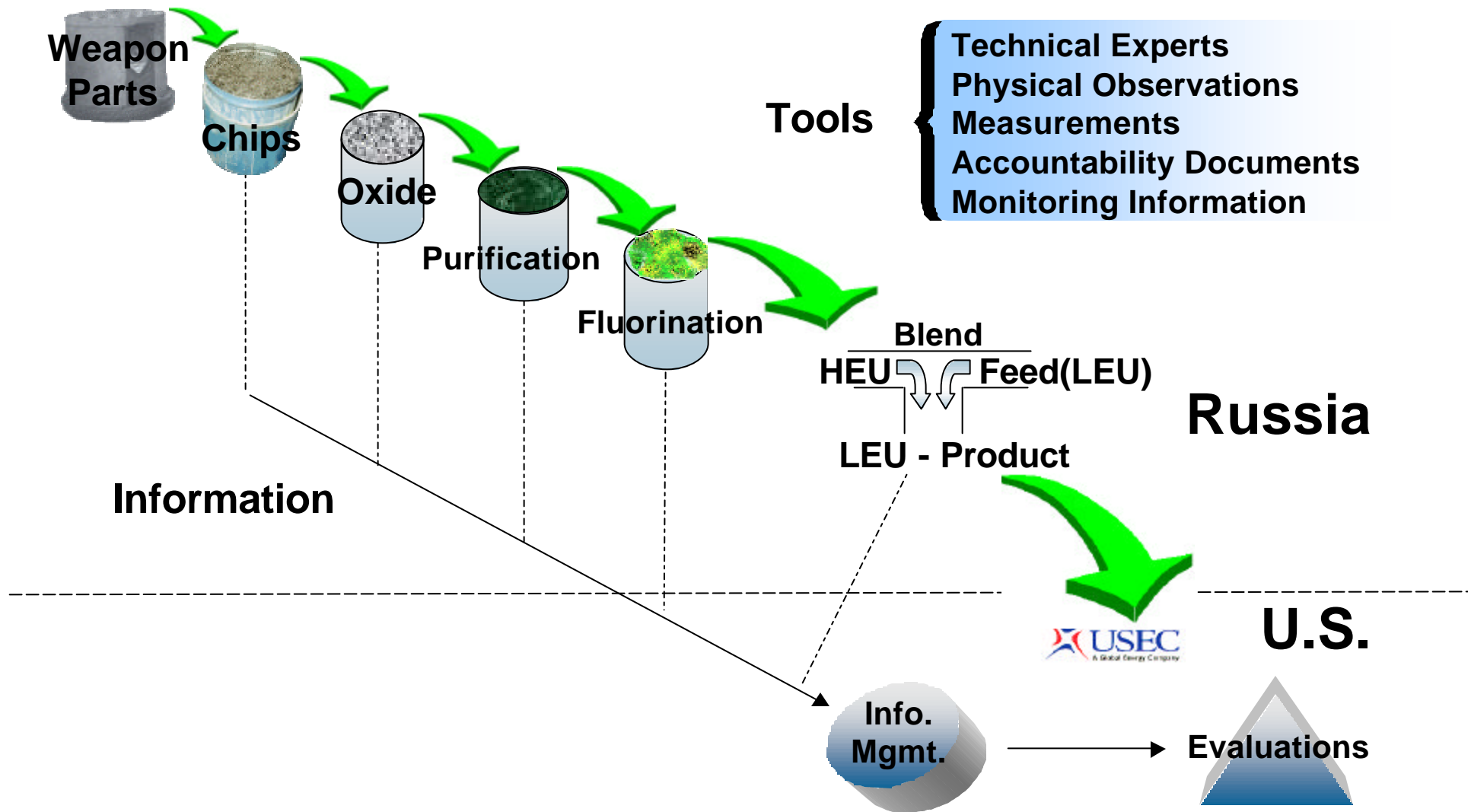


Double lines indicate discontinued activities. Stop sign at UEIP indicates fluorination operations ceased in 1997.

USEC - United States Enrichment Corporation
MPA - Mayak Production Association, Ozersk
UEIP - Ural Electrochemical Integrated Plant, Novouralsk

ECP - Electrochemical Plant, Zelenogorsk
SChE - Siberian Chemical Enterprise, Seversk

Transparency Process



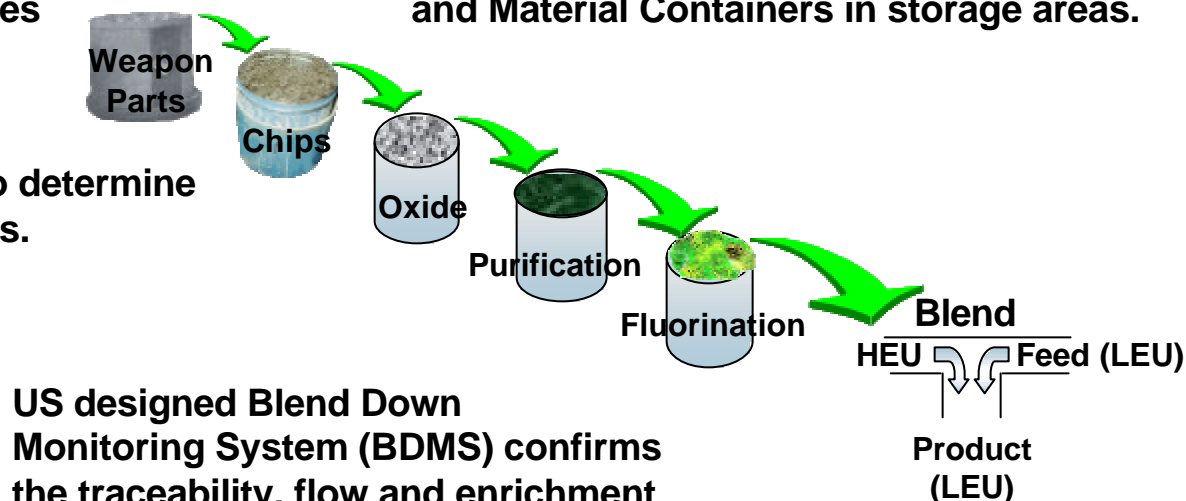
HEU-TIP Monitoring Activities to Assure Nonproliferation Objectives are Met

Monitors annually conduct up to 24 Special Monitoring Visits to Russian uranium processing plants and staff a Permanent Presence Office (PPO) at UEIP to gather data on Material Processing Rates and Material Containers in storage areas.

Portable Non-Destructive Assay (NDA) Instrumentation is used to determine HEU assay in Russian containers.



Portable NDA Testing Equipment



US designed Blend Down Monitoring System (BDMS) confirms the traceability, flow and enrichment assay of HEU being blended into LEU. The BDMS was installed at UEIP in January 1999. Additional BDMS units to be installed at ECP and SChE.

Monitoring data and analysis is compared with Russian Declared Rates and Inventories for consistency and accuracy.

HEU-TIP Observations

What is performed?

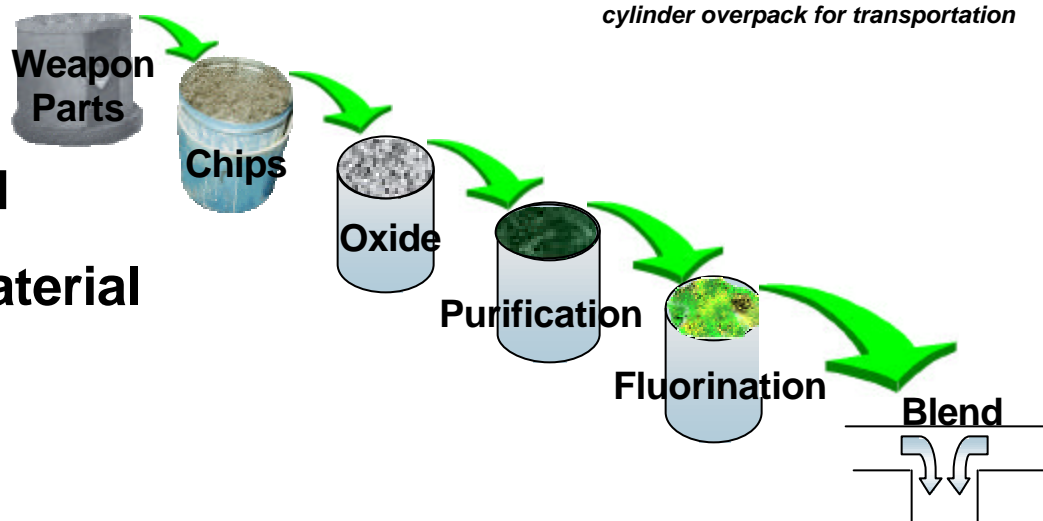
- Expert observation of process
- Tracking selected containers
- Compare observation and forms with process



30B cylinder (left) for LEU and cylinder overpack for transportation

What is observed?

- Process equipment used
- Process facilities and material



Where?

- All four facilities

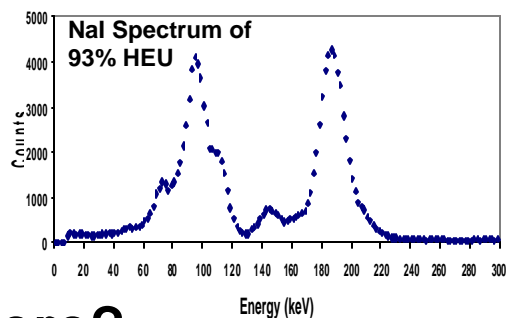
HEU-TIP Non-Destructive Assay (NDA) Testing

What is used?

- Portable NaI based measurement equipment

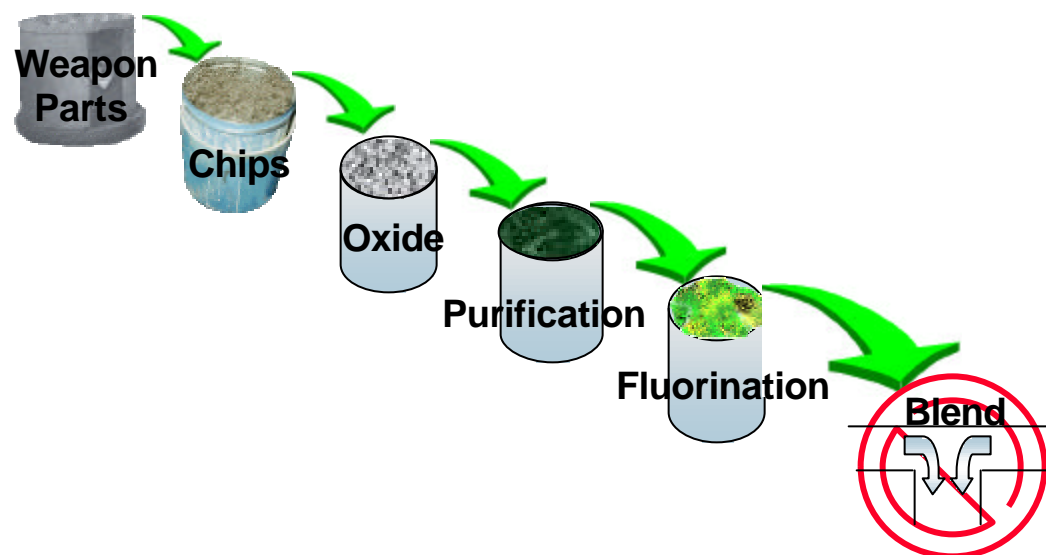
What is measured?

- Assay of HEU



Where?

- All four facilities



HEU-TIP Tags and Seals

What is used?

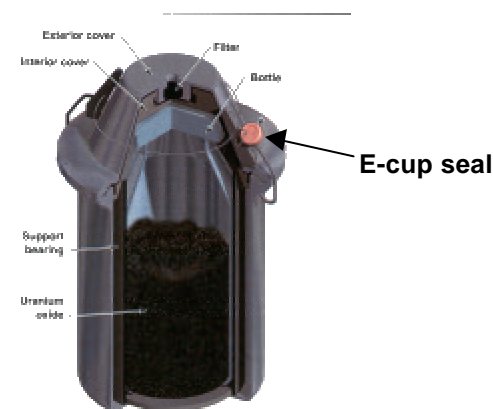
- Mylar/tape seals
- E-cup seals
- Multi-lock seals

What is measured?

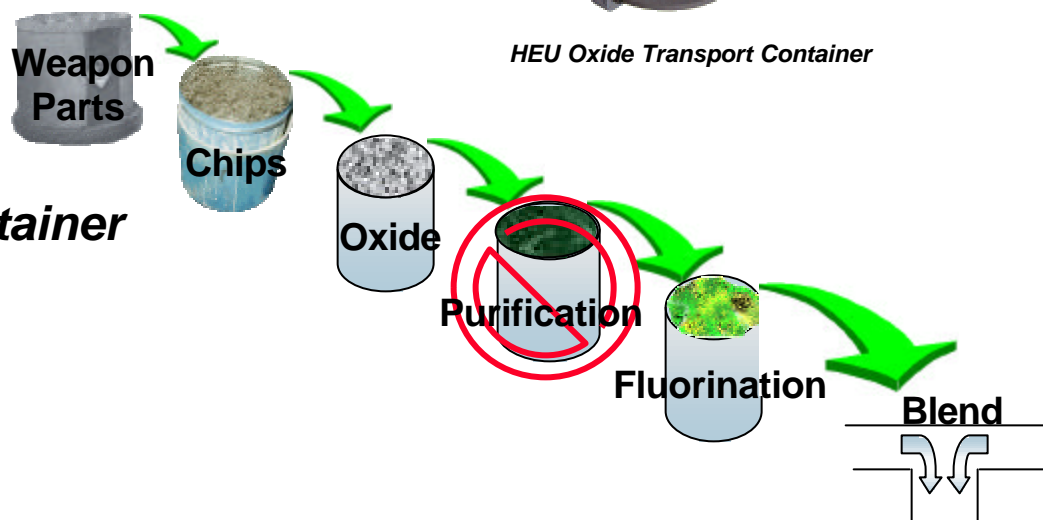
- Tamper indications for:
 - *NDA units, BDMS*
 - *Transport of HEU container (chain of custody)*
 - *Orifice plates*

Where?

- All four facilities



HEU Oxide Transport Container



HEU-TIP Blend Down Monitoring System (BDMS)

What is used?

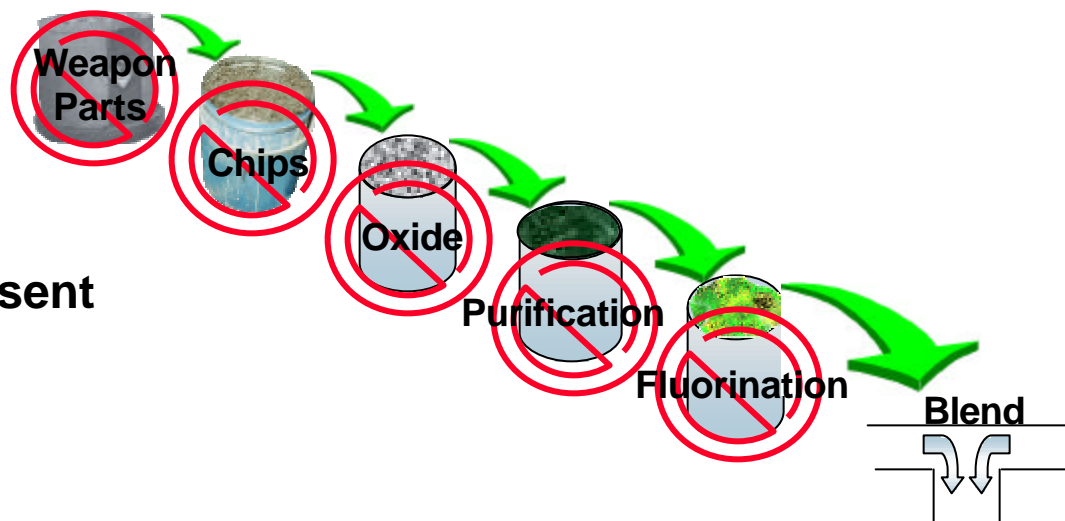
- US System is designed to confirm the traceability of HEU being blended into LEU
- Confirm flow and enrichment assay
- It cannot determine HEU origin

What is measured?

- Enrichment Assay
- Material Flow
- Traceability: HEU to LEU

Where?

- UEIP - January 1999 to present
- ECP - TBD
- SChE - TBD





HEU-TIP Monitoring Activity through Calendar Year 2000



- **Number of Visits**

- ***Special Monitoring Visits (includes Familiarization Visits)***

◆ SChE	29
◆ ECP	21
◆ MPA	19
◆ UEIP	15

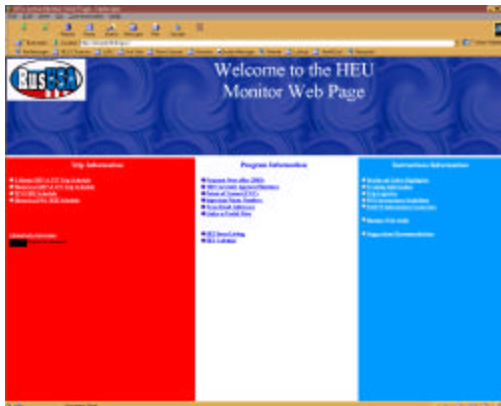
- ***Permanent Presence Office Assignments***

◆ UEIP	60
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- ***Technical Installation Visits***

◆ UEIP	4
◆ ECP	2

HEU-TIP Information Management



**Monitoring Measures
Evaluation Report**

**Data
Evaluation**

**Annual Processing Report
Monthly Mass Balance Reports
Monitor Trip Instructions**

Data Analysis

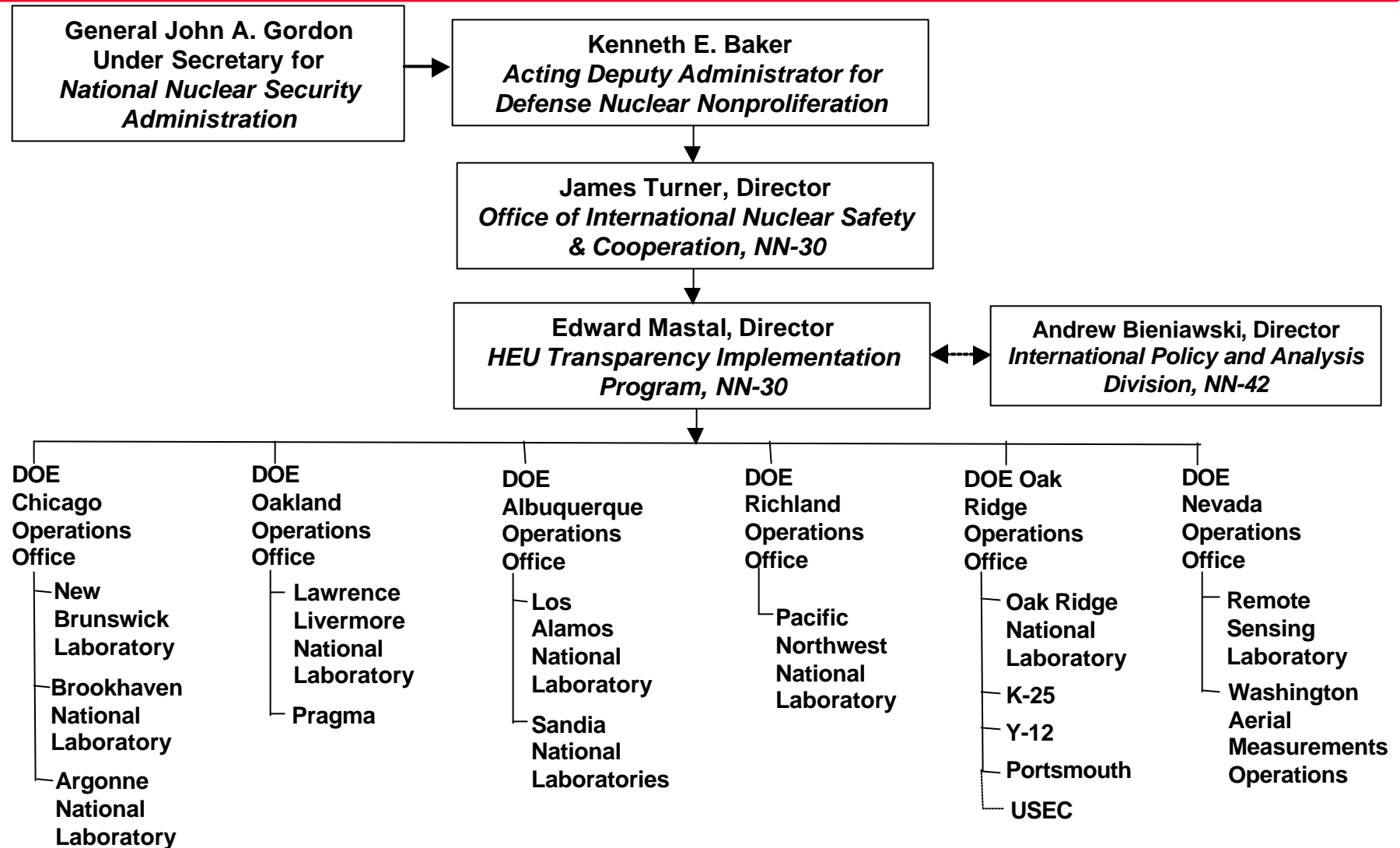
**Expert Observations
Portable NDA Data
BDMS Blending Data
Monitoring & Forms Data
Plant Control & Accountability Data**

**Data Accumulation
(DARTS*)**

* Data Archive, Retrieval and Transfer System

HEU-TIP

Organization & Coordination



HEU-TIP Strengths

"I believe that there is nothing more effective at present than this program..." Yevgeniy Adamov, Minister of MINATOM

- Significant pathfinder experience with more than five years organizing and conducting monitoring trips to four uranium processing plants in Russia.
- HEU-TIP coordinates its monitoring activities through an extensive infrastructure involving six DOE field offices and nine DOE laboratories located throughout the United States.
- Transparency Review Committee established in 1994 negotiates monitoring rights between Russia and the United States.
- Greater influence with MINATOM due to \$12 billion, 20-year USEC contract.
- An established relationship with MINATOM and uranium processing plant personnel.
- Strong monitoring expertise with a pool of 150+ monitors.
- Specialized monitoring technology being used and improved.
- Extensive computerized data archive, retrieval, and transfer system.
- Inter- and Intra-agency coordination.



HEU-TIP Coordination with other Programs



- **Information Sharing with Other Organizations:**
 - **Material Protection, Control, and Accounting (NN-50)**
 - **Comprehensive Threat Reduction Program**
 - **Mayak Fissile Material Storage Facility**
 - **Fissile Material Disposition Program (US HEU & PU/Russian PU)**
- **Support includes:**
 - **Working group to facilitate problem solving**
 - **Russian facility information**
 - **Coordinating work efforts during site visits**
 - **Sharing HEU-TIP work products**
 - **Health and Safety Plan**
 - **Russian Facility Data**
 - **Experience**
 - **Expertise**



HEU-TIP Accomplishments for Calendar Year 2000



- Four Russian uranium processing facilities were monitored for about 280 monitor-weeks.
- Monitors used portable NDA equipment to confirm HEU enrichment in about 2,000 containers.
- Monitors observed about 20 percent of all containers that contained weapon components, chips, purified oxide, and UF₆ used for contracted HEU.
- The BDMS operated at UEIP. Final installation adjustments completed in December 2000.
- Monitors and BDMS observed the blending of about 30 percent of the contracted HEU. Photocopied data process forms were exchanged with Russia four times during the year.
- The HEU Health and Safety Plan was revised and updated. This plan was provided to NN-50/60 for developing their own plans.
- HEU-TIP and MPC&A enhanced cooperation with a working group to exchange information.
- A secure computer system between 11 U.S. sites to centralize and manage monitoring activities and data was operated.
- Monitors provided voluntary humanitarian efforts in Russian communities.
- The GAO conducted a favorable review of HEU-TIP.

Summary

United States and Russian cooperation has resulted in the unprecedented success of our joint transparency activities to support the nonproliferation goals of the HEU-LEU Agreement



US, Russian monitors, and baby Sophia with her mother at SChE